CHAPTER 15

Cloud Computing and Adult Literacy

How Cloud Computing Can Sustain the Promise of Adult Learning?

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15.1 INTRODUCTION

Adult literacy in Canada consists of a patchwork of large and small adult education providers: many of them are autonomous community societies, some are school boards, and others are community college based, as well as a range of independent community-based groups. Funding for adult literacy comes from several pockets: from different provincial and/or federal government departments and from charitable organizations. Much of the federal funding is short term in response to shifting government priorities. Indeed, Crooks et al. [1] suggest that the ongoing funding search, with the attendant application and reporting activities, detracts from the ability to provide more effectively planned and sustainable adult education programs. A major challenge for adult literacy providers is that while their client base has significant human and economic potential, low-literacy adults are not perceived as large contributors to the economy, and thus, much of the funding is intermittent—from project to project. Without sustained and sustainable resources to exploit technologies, nor exposure to the use of technologies for teaching, adult literacy providers will remain very traditional in their use of face-to-face pedagogy and remain relatively

unexposed to the potential benefits of technology-enhanced learning and cloud computing.

The structures of adult learning and adult education organizations and learners in Canada make the use of cloud computing particularly appropriate. Informal learning and semiformal community-based learning are the dominant modes of adult learning within small businesses, trade unions, cooperatives, industrial and commercial enterprises, hospitals, prisons, and religious and cultural organizations. There are no statistics on the amount of informal learning that is occurring, but according to Cross [2], there is general agreement that it is growing rapidly. Cloud computing can be used to address the increasing cost and complexity of providing the state-of-the-art e-learning services that are beginning to outstrip the abilities and resources of adult education institutions and organizations. The degree of integration and interoperability required to provide seamless service is becoming too complex for smaller entities to manage efficiently. In addition, higher level functions such as sophisticated data analytics that could be valuable tools in understanding adult education processes cannot be developed as quickly as necessary, if at all. Computer service departments struggle to keep up with the growing demand for IT services on campuses. New approaches are required if adult education institutions and organizations are to effectively meet the demands of learners and other stakeholders for ever more sophisticated services, while still working within the growing budgetary constraints of both the organization and the adult learning sector as a whole. Cloud computing could form a major part of an effective solution to this problem.

Many institutions and companies are moving rapidly to adopt *cloud computing*, a term that refers to accessing Information and Communications Technology (ICT) services across the Internet. The computers and software applications are housed on Web servers in large industrial-scale computing centers rather than provided locally. The first benefit of these commercial "computing utilities" is that they can harvest the economies of scale and offer services at a fee that is far lower than most organizations would require to implement and maintain their own computing infrastructure. To lower energy costs, cloud providers locate their data centers near power generation facilities; to lower staff costs per machine, cloud providers install vast numbers of computers in each server farm. Many institutions already benefit from these economies of scale by outsourcing e-mail to Google or Microsoft.

The second benefit of cloud computing is in having large-scale data processing resources available "on demand." Scientists with analyses that might take hours or days to execute on a single computer can speed the processing by tasking the cloud to provide the equivalent of hundreds of computers for a few minutes. Lower costs and flexible computing on demand are the two key advantages of cloud computing. The impact is already being felt in some institutions and businesses; cloud computing will soon spread to other areas of the economy and to adult literacy organizations that become aware of its benefits.

Cloud computing can be an industrial-scale replacement of the "cottage industry" approach to institutional computing that now exists within institutions and organizations. Much of the capital costs of institutional computing can be converted to lower operating costs. With the cloud, the physical space and the energy ICT consumes are reduced in-house, yet the available computing power is greatly increased. In addition, elastic scalability allows users to increase or decrease computing capacity as needed [3].

At first blush, cloud computing seems to be an entirely technical issue since adult literacy educators, like most consumers, are blissfully unaware of the technologies they access. They search the Web or book airplane tickets with little thought to the layers of hardware and software that provides these services. However, a major paradigm shift will lead those using technology to rethink the services they offer and how they are offered. For example, the emergence of the World Wide Web Mosaic Browser in 1995 made it possible to both publish and retrieve information without having an intermediary, while also reducing the difficulty in publishing information quickly and at a much reduced cost. This had a huge impact on the world of distance learning that until then leaned toward "big mass media" paper publications and television. The "anyone-can-publish" environment brought on by the World Wide Web meant that almost any institution could offer distance education, a capability they are now adopting in ever increasing numbers. By 2005, the integration of mobile telephones with the Internet literally meant that anyone, almost anywhere, could connect to the world's information systems. This has been particularly beneficial to democratizing information access in developing countries, and mobile phones have become the main consumer channel for both voice and data services. The ability to "leapfrog" the millions of miles of copper wire and boxes that plug

into electrical outlets has enabled emerging and developing countries to partake in the knowledge economy at a faster rate and to partially close the digital divide.

Piña and Rao [4] argue that cloud computing is creating "new IT [Information Technology]-enabled market constructs" and it will have a profound effect on IT management. The cloud will challenge everyday business models from which the educational and economic sectors cannot escape. The shift to cloud computing provides an opportunity for adult literacy providers to implement and/or restructure their online operations and decide what services to offer and how they will be provided. However, this will not happen automatically. The adult literacy sector in Canada faces endemic regionalization and programming challenges that have little to do with computing, and everything to do with politics, funding, community leadership, and professional collaboration.

A symposium of e-learning experts sponsored by Contact North [5] identified a number of specific operational and technical challenges, all of which could be viably addressed using cloud computing. These include addressing content quality, learner support, the e-learning compatibility of administrative systems, ongoing IT management infrastructures, tools, broadband availability, support services (helpdesk), and the evergreening of IT.

de Broucker and Myers [6] recommended the implementation of a public policy framework for adults that acknowledges the "right to learn." This includes financial support, incentives for employers, and more government investment using a "coordinated approach to respond to adult learners' needs." Support for cloud computing would go a long way in addressing these recommendations.

While cloud computing can be used to lower the costs of providing a technological infrastructure for adult literacy, there will still be real costs—the economics of cloud provision have yet to be fully defined and understood. The cloud investment can reasonably only be realized with sufficient stable funding. Building a collaborative community around cloud computing might be a way to bring a large number of educational resources together to develop and sustain a coherent and cost-effective delivery model for adult literacy training that would benefit many. It may also provide the cross-fertilization of ideas and talents to see a new range of literacy services that will help low-literacy Canadians cope with our text-laden society.

This chapter is organized around four questions:

1. What is cloud computing and why is it important for adult literacy?
2. What is the current state of adult literacy education in Canada and is a cohesive online adult literacy community feasible?
3. What is the current use of information technologies to support adult literacy?
4. What might a cloud computing strategy for adult literacy look like and what are the challenges to realize such a vision?

Technical issues aside, the changes cloud computing brings may provide an unprecedented opportunity to revolutionize the way in which we offer adult literacy training and new literacy services that can hasten the integration of low-literacy adults into society. The cloud could facilitate the alignment of institutional processes, and therefore enable the reduction of system complexity. There are legitimate reasons for institutional or organizational differences: size, programming, structure, and operational mandate, all of which provide significant reasons for differentiation. The initial benefits from an adult education cloud are in outsourcing the infrastructure costs. However, the areas of significant gain can still be realized at the application level with, for example, e-mail and shared learning management systems, content management systems, automated assessment systems, and Web conferencing systems. These would represent the initial applications that would formulate a common cloud provision.

15.2 QUESTION 1: WHAT IS CLOUD COMPUTING AND WHY IS IT IMPORTANT FOR ADULT LITERACY?

Cloud computing is a nebulous term

—Anonymous

Wikipedia notes that the cloud concept originated among telephone networks and that "The first scholarly use of the term *cloud computing* was in a 1997 lecture by Ramnath Chellappa."

According to Pingdom [7], the term "cloud computing" was launched into the mainstream in 2006 when Eric Schmidt, CEO of Google, used the term when describing Google's own services during a search engine conference: "It starts with the premise that the data services and architecture

should be on servers. **We call it cloud computing**—they should be in a 'cloud' somewhere." AQ 1

The National Institute of Standards and Technology (NIST) defines the term as follows:

> Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction [8].

In common usage, cloud computing has grown to mean Internet access to large-scale computing facilities provided by others. There are a few key concepts which are described below.

15.2.1 Economies of Scale

The cost of providing ICT has become a growing concern for many organizations. For example, a large university with tens of thousands of students might be expending over $500,000 each year just for the infrastructure (servers, software, storage, staff, and communications) to provide e-mail. However, Google has a huge e-mail facility that currently provides millions of G-mail accounts for no fee (so what is a few thousands more). Cloud providers have located their computing facilities near power generation facilities (so the electricity is "greener" and cheaper since less power is wasted in transmission) and their large facilities are more robust and require fewer staff per e-mail account to maintain than small facilities. Google Apps for Education is currently providing free e-mail and other applications such as document sharing to entice universities to make the switch to greener and cheaper cloud computing services. Microsoft and Amazon (and others) are also offering cloud services on a large scale. AQ 2

In traditional ICT organizations, increasing computing capacity requires additional capital investment followed by increased operating and maintenance costs. As with erecting a new building, the infrastructure needs to be maintained regardless of usage. In contrast, cloud computing is like renting space in a building—you only pay for the space and services as long as you need them. The cost of the building is amortized over a large number of tenants. Since cloud tenants connect via the Internet, their number can be very great and their share of costs can be very small compared with traditional ICT costs.

The economies of scale can also apply to the adult literacy community. The development of an adult literacy cloud could help reduce this funding sustainability gap by allowing more effective planning and provision of services. This is not a simple task, however, and will require significant and involved collaboration across the adult education sectors, yet institutions and organizations appear to have few viable alternatives. A freely accessible adult learning cloud computing environment or medley of environments could provide significant financial savings for learners, employers, and adult learning organizations and institutions while at the same time forming the basis for coordinated approaches to learning delivery provincially or even nationally. A long-term investment in a cloud for adult learning in Canada would not only reduce the cost and increase the scope of technology services but also enable institutions to create more meaningful and realistic technology plans that address the short- and long-term technology needs of their program delivery. Of course, this coordination of services would also have to address issues such as data and personal privacy. Low-literacy refugees from war-torn countries may be reluctant to use free services if there is the slightest chance that their identities are not protected.

15.2.2 Virtualization

Today's computers are both fast and powerful and are capable of serving several users at the same time. Each user is given a share of the computer's time and resources, and several "virtual" computing sessions can be run at the same time; the typical user does not even notice that they are sharing a computer. Every job that accesses the cloud through the Internet is assigned to the next available virtual space—often on a different physical computer than the last virtual session. The cloud management software looks after the job allocations, constantly shifting usage to optimize the use of several computers connected together in the cloud. Fewer computers are needed in the workplace than in the current desktop environment where each user has his/her own personal computer.

15.2.3 Device Independence

Since the data processing is done "in the cloud," the user no longer needs a powerful (nor expensive) desktop computer. Smaller and cheaper workstations, "notebook" computers, and mobile devices such as tablet computers or even "smart phones" can connect to the cloud via the Internet. The cloud will be able to reformat the output to suit the user's device—perhaps reading out loud to a mobile phone rather than sending text to

its small screen [9]. Moreover, users can alternate devices and access their applications and content independently from wherever they are located using any Internet-capable device. For adult learning institutions, device independence may result in using the scarce financial resources for software and hardware purchases and maintenance more effectively as they do not need to provide and support physical computers. The lower cost may also enable greater access to computers by learners, as they can find less-expensive alternative access devices. Technical support could be provided from more aggregated central units, and therefore lower cost, addressing a current need especially in community-based agencies where practitioners commonly provide their own support.

15.2.4 Elasticity

With desktop computing, each user is limited to the resources (processing, memory, and data storage) available in his/her personal computer. With cloud computing, users can request as much computing power as they need. For example, Roth [10] discusses how he recently used a cloud computing facility to find a missing security code by testing every possible combination until he found the one that fit. With a desktop computer, this might have taken years, but by programming a cloud to run hundreds of virtual copies of his/her program at the same time, the missing code was found in minutes, at a cost of about $2. Cloud resources are said to be "elastic"—they can expand or contract to the amount of computing power needed at any given time. This means that very powerful analyses can be conducted more readily than would be feasible on a desktop computer. Keahey et al. [11] note how several scientists can schedule the use of a shared cloud and that open-source cloud software makes it possible to quickly create new cloud installations. Of course, licensing approaches will need to be more flexible for this to be advantageous. A more flexible, "pay-as-you-go" approach will need to be integrated into licensing structures.

15.2.5 Cloud Service Models

Cloud services typically fall into one of three technical/marketing categories: infrastructure as a service (IaaS) in which the expert user implements his/her own software to optimize the use of the computing facility; platform as a service (PaaS) in which the client customizes his/her application to run inside the cloud management software; and software as a service (SaaS), such as Gmail, in which the user simply uses the software provided. This flexible approach means that an organization with special needs

and appropriate technical skills can build their own computing solution, while customization and the use of generic software can meet most users' requirements. As a rough analogy, if IaaS were renting a car at the airport, then PaaS would be hailing a taxi and SaaS would be taking the public bus. The service models provide options to suit user independence, expertise, budget, and technical needs. Different services will have different benefits; the uptake rate will be influenced by the applicability within organizations. The models will need to evolve with requirements of the adult literacy providers and their needs for the cloud; executing working cloud models and ensuring satisfactory quality of service are essential.

15.2.6 Concerns over Cloud Computing

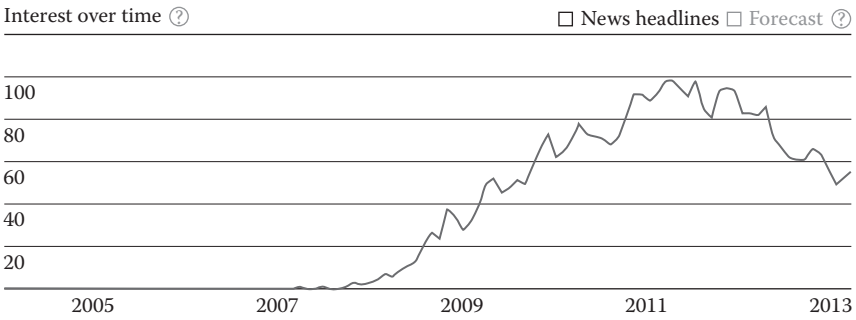
The major concern is about *security*. Since it is difficult to know where a virtual job will be processed (i.e., where the computer is physically located), data may easily cross international boundaries and suddenly be open to legal inspection in other countries—this would be a concern, for example, should Canadian data that are supposed to be protected under Protection of Privacy Laws cross over to the United States and be subject to the Patriot Act. Haigh [12] notes that Microsoft located its European e-mail server farm in Dublin to avoid client concerns that their data would be open to the US government. Private, secure, or mission critical data should not be processed in third-party public cloud computing environments. Secure data could be processed in private clouds—for example, Danek [13] notes that the Canadian government forecasts to set up its own secure cloud computing environment to rationalize the use and cost of government ICT infrastructure across several departments. A cloud run on systems based in Canada would be an essential investment for the adult education and adult literacy sector across the country. Clients of these programs often belong to marginalized groups that share concerns about the protection of their privacy and use of personal information. In jurisdictions where adult literacy programs are publicly funded, client data include information about government services that needs to be secure and protected.

The second concern is the need for a *fast and reliable Internet connection*. Cloud computing involves rapidly moving the data to be processed elsewhere, and then quickly returning the results. A slow or intermittent Internet connection can interrupt the data flow and separate the user from the virtual machine. (One author of this report had to retype several paragraphs when a communications interruption disconnected him from the

word processing application in a cloud environment.) As more and more Internet traffic flows through fiber optic cables, bandwidth will increase and communications costs will decrease. However, cloud computing may not be a successful strategy for users in rural and remote communities until they can be assured continuous robust connectivity.

The third concern is about *switching costs*. Many legacy software applications will need to be moved to the cloud environment and incompatibility in design standards can pose significant hurdles and be quite costly when porting them to a cloud platform. Fortunately, as has been mentioned earlier, very few adult literacy organizations have investments in ICT. However, the costs of "lock-in" cannot be avoided. The "Monkey and the Coconut" tale suggests that you can catch a monkey by chaining a coconut to a tree and boring a hole just large enough for a monkey to reach its hand in and grab a fistful of honeyed rice. The closed fist is too large to go backward through the hole. For the monkey to be free of the trap, it has to let go of its investment in the bait. The costs of "letting go" from a cloud service or an internal ICT infrastructure may be insurmountable—just as it is difficult for a homeowner to dispute the rate hikes by the local electricity provider by threatening to get energy from another source. It is conceivable that in future, the "free" Google and Microsoft academic and e-mail services may come at a price to recover the costs or for profit. At that point, institutions may be "locked in." AQ 3

The fourth concern is *hype*. Katz et al. [14] note that cloud computing seems to have caught the attention of almost every technology journalist to the point where it might be oversold. While the cloud has arrived for common services such as e-mail, for many other services the transition may take much longer. Much technical and policy work remains to be done by the adult literacy community to determine which applications can go to the cloud and which require a more conservative approach. Expectations will need to be adjusted to reflect realistic and achievable applications. Figure 15.1 shows the exponential growth in the number of Google searches using the term "Cloud computing." As typical of new technologies, the "hype cycle" peaked early in 2011 followed by a leveling-off period as understanding became widespread and pilot implementations took place. This may hit a further inflection point as another wave of cloud-based services is created, which may include education. The graph does not necessarily show a lessening interest, rather a lessening novelty. As cloud computing becomes mainstream, there is less need to discuss what it means anymore, just how to do it, from envisioning to engineering.



AQ 4 FIGURE 15.1 Google trend plot of the term "cloud computing" taken on February 22, 2013. The number 100 represents the peak search volume.

15.2.7 Summary

Cloud computing changes the efficiencies and economics of providing ICT services. Large cloud "utilities" are being developed that will make it cost-effective to move many if not most ICT services "to the cloud"; the nature of the services provided can be negotiated with the cloud provider. Virtualization will enable several computing jobs (such as word processing or e-mail users) to run on a single computer, while elasticity makes it possible to have huge amounts of computing resources instantly available to meet the demands for intensive data processing. Cloud computing is evolving rapidly and new methods to ensure effective management and security will emerge. Currently, most applications of cloud computing are in administration and research, but the ability to build and share powerful new processes will rapidly expand the variety of services available. This is where the greatest potential might lie for adult learning and literacy training.

Katz et al. [14] provide the following list of the benefits of a cloud computing approach:

- Driving down the capital costs of IT in higher education
- Facilitating the transparent matching of IT demand, costs, and funding
- Scaling IT
- Fostering further IT standardization
- Accelerating time to market by reducing IT supply bottlenecks

AQ 5
- Countering or channeling the ad hoc consumerization of enterprise IT services

- Increasing access to scarce IT talent
- Countering a pathway to a five-9s and 24 × 7 × 365 environment AQ 6
- Enabling the sourcing of cycles and storage powered by renewable energy
- Increasing interoperability between disjointed technologies and within institutions

These benefits can explain the growing interest in cloud computing among a wide variety of organizations, institutions, and businesses around the world. Figure 15.1 reflects a typical "Gartner hype cycle" for a new technology that is moving from hype to implementation.

The line shows the exponential growth in the relative number of Google searches followed by a decline in searches as the term becomes a part of mainstream computer understanding.

15.3 QUESTION 2: WHAT IS THE CURRENT STATE OF ADULT LITERACY EDUCATION IN CANADA AND IS A COHESIVE COMMUNITY APPROACH POSSIBLE?

It is beyond the scope of this chapter to completely portray the current state of adult literacy in Canada. There exist a number of excellent studies and literature reviews already published on this topic by researchers and government organizations [15–23]. Their portrayal is consistent with the Organisation for Economic Co-operation and Development (OECD) [24] thematic report on adult learning: Canada is a vast country, and despite a wide variety of regional and federal programs that contribute to adult literacy, there remains a shortage of programs especially in rural and remote areas. There is a general need for additional programming for adults, particularly for Aboriginal peoples and for the working poor. The thematic report also expresses concern that the lack of a coordinated federal–provincial policy on adult literacy makes it difficult to resolve many issues such that

- The special needs of adults are generally neglected.
- There is no sense of a coherent system of adult education.
- Adult education is vulnerable to instability in government [24, pp. 42–43].

Adult education and literacy in Canada is also divided by different approaches and organizational types. In some regions, it is community groups that deliver the bulk of adult literacy education, whereas in other areas, this is left to community colleges or partnerships of both. Funding comes from a mix of federal employment initiatives and provincial education programs. The funding is usually short term, and literacy providers spend a good deal of their time applying for the next grant or writing reports. The Movement for Canadian Literacy [20] claims that the lack of a long-term funding strategy makes it difficult to sustain programs and staff. Horsman and Woodrow [19] describe adult basic education as "the poorest cousin of the education system."

There are three main target audiences for adult literacy education:

1. Canadians from rural and remote areas where access to education is limited. (This includes a large number of people with Aboriginal ancestry, some of who have been educated in English and others in their native Aboriginal language.)
2. School leavers who fail to complete high school due to a complex array of reasons and become trapped in the "working poor" layer of the economy and may require to upgrade their skills to retain their job or to search for alternate employment.
3. "Newcomers to Canada," that is, recent immigrants from around the world who are generally (but not always) literate in their own language. (In some jurisdictions, adult literacy and English as a Second Language (ESL) programs are funded and delivered separately.)

Federal funding is generally targeted to assist newcomers to Canada to become functional in one or the other of the official languages, and there is a pattern of successful economic integration particularly by the second-family generation in urban areas. The OECD [23] identifies Aboriginals and the working poor as the two populations least served by adult education programs. Many Aboriginals grow up in isolated areas and learn English from parents for whom English was an imperfectly learned second language. Many of the current generation also often fail to master their own native language and are caught between two cultures. The increasing urbanization of the Aboriginal population brings many within reach of targeted literacy programs, and there are a number of e-learning approaches that are being initiated to reach those in remote areas. However,

low-literacy adults in isolated communities are among those with the least access to Internet connectivity and computers.

Some 20% of Canadians form "the working poor" earning less than one-third of the median wage [23]. Many of them are also in rural and remote areas and traditionally earned their living in the primary resources and agriculture sectors. With the decline of the resource economy, many lack sufficient education to access retraining for other jobs. Others simply cannot access the existing daytime literacy programs because of commitments to work or family care.

While there are a lot of people falling through the cracks, some adult literacy practices are making significant inroads. Prior Learning Assessment and Recognition enables individuals to get recognition for life experiences and skills, and the resulting academic credits make academic credentials accessible. In BC, considerable work has also taken place in "laddering" or AQ 7
transferring credits earned in college or trades as entry paths into higher education. In Alberta and the Northwest Territories, the Alberta–North collaboration of higher education institutions and community organizations that provide technology access and educational support in 87 remote communities enables a large number of learners to become the first in their family to earn a degree.

Despite the low level of federal–provincial coordination in adult literacy, the community is organizing itself into regional and national networks to exchange information and educational resources. Of particular note is the National Adult Literacy Database (www.nald.com) that maintains a repository of up-to-date research and AlphaPlus (www.alphaplus.com), which also shares learning resources. When the Canada Council on Learning ended its mandate in 2009, the Adult Learning Center spun out the Movement for Adult Literacy, which is now the National Literacy Learning Network, a forum for all of the regional literacy networks across Canada.

Adult literacy deficits are not unique to Canada, but are also found in Australia, the United States, and other industrialized countries, some of which are large developed countries with remote areas populated by resource workers and Indigenous peoples, and others have large urban populations. Literature from these countries reveals many of the same issues and offers relevant approaches to provide adult literacy education. Ideally, it would seem that the place to prevent adult literacy problems is in primary school education. However, literacy education starts in the home and the influences of early community literacy are well documented [16].

Life-long learning has become ever more important as adults have to readapt to ever-increasing demands of their skills and knowledge. As the OECD states in the introduction of the Programme for the International Assessment of Adult Competencies (PIAAC) survey that has been undertaken in many countries in 2012,

> Governments and other stakeholders are increasingly interested in assessing the skills of their adult populations in order to monitor how well prepared they are for the challenges of the modern knowledge-based society. Adults are expected to use information in complex ways and to maintain and enhance their literacy skills to adopt to ever changing technologies. Literacy is important not only for personal development, but also for positive educational, social and economic outcomes. [23]

PIAAC assesses the current state of the skills in the new information age and in that builds upon earlier conceptions of literacy from International Adult Literacy Survey (IALS) in the 1990s and the Adult Literacy and Life Skills (ALL) Survey in 2003 and 2006. In the process, the definition of literacy has changed from reading and writing to including skills essential to successful participation in work, family, and community environments in the information age. This reconception of literacy has not only driven the need of governments in industrialized countries to assess and better prepare their population for the workforce but also put the importance of technology-based learning and sharing of resources on the fast approaching horizon.

15.4 QUESTION 3: WHAT IS THE CURRENT USE OF INFORMATION TECHNOLOGIES TO SUPPORT ADULT LITERACY?

Although technology rapidly evolves, there are four basic patterns of using technology for literacy education:

1. Learners receive *individualized computer-based lessons* from physical disks or via Web sites. The Web delivery is becoming more practical as it resolves the software distribution issues and learners can maintain records of their progress; however, in areas with poor Internet access, it may be more practical to transfer the lessons by CD-ROM or DVD. Drill and practice sessions are particularly effective for initial

skills and knowledge including phonetics, building vocabulary, and improving spelling and learning grammar. Audio–video materials such as podcasts can also help create a contextual awareness of language conventions. Literacy might borrow techniques from a number of very effective second language learning Web sites such as japanesepod101.com that match services to the motivation and budget of the learner. Free materials are very useful, but study texts, drills, and maintenance of a vocabulary portfolio require a subscription. Tutor-mediated online conversation sessions are available for an additional fee. An unexpected boon has been the wealth of free informal learning materials available in the video format on Web sites such as youtube.com.

2. *Online course or workshops* can be used to offer higher order learning activities such as reading and discussing articles from newspapers with other learners in a text or voice chat. Cohort-paced online courses enroll learners in a group so they move through the learning activities about the same time and speed. The cohort reduces the feeling of isolation; learners can interact to discuss the course content and to give each other support. A course facilitator or instructor or tutor helps the group move through the materials in a timely fashion and provides answers to questions that may arise. Cohort-paced courses typically have lower dropout rates than independent courses or self-study materials. In some instances, cohorts may involve synchronous computer conferencing; however, the scheduling of such events can be complicated and they can make it difficult for learners who have other obligations such as child care, shift work, or travel. Some community learning centers also equipped with broadband videoconference facilities that make it possible to bring small groups of learners together for work or study sessions, although the main use to date appears to be for the professional development of the tutors rather than for literacy instruction [25].

3. *Web searches, e-mail, conferencing, writing, blogging, and digital media projects* are authentic everyday communications activities that provide rich opportunities for literacy instruction. This type of support is best provided in (or from) a learning center where a staff member can be available to assist learners with the technology and with their literacy tasks. The completed artifacts can be copied into an e-portfolio to promote reflection on progress over time. There is

no reason why the instructional support could not be given at a distance. This would benefit transient literacy learners, especially if they could access their personal files from any Internet connection.

4. Another area is the use of *assistive technologies*, for example, software that can help the learner by reading electronic text files out loud, or providing online dictionaries and other reference materials. Some assistive software that patches onto Office software and reads text as it is composed has been particularly useful for English language learners and learners with dyslexia [26]. Assistive software will become portable and personal as the number of smartphones that link to the Internet increases and a wide variety of assistive applications emerge for that platform.

AQ 8 Despite this enormous potential, technology has not built a strong following among literacy providers. Holun and Gahala [18] note that technology has a reputation as a "moving target"—by the time a serious intervention can be developed and evaluated, the technology has moved along. Another reason is the lack of technology accessible to literacy learners and the relatively low number of studies examining the use of technology for literacy training. Finally, Fahy and Twiss [15] note that while adult literacy educators are beginning to use technology for their personal communications and professional development, few have adopted technology to their teaching practices.

However, there are also many literacy programs that have embraced the use of technology in their program provision. In Ontario, adults can learn online through the Web-based literacy training provided by five e-Channel programs using a variety of synchronous and asynchronous delivery methods [27]. Several classroom-based programs across Canada use technology-based resources as an integrated part of literacy training or to supplement in-class learning providing opportunities for reinforcement and scheduling flexibility for their clients. The following describes a few of these programs.

As one of the e-Channel providers, Sioux-Hudson Literacy Council's Good Learning Anywhere program has used technology-based resources to reach clients in remote communities since 2003. The program employs six to seven instructors and five mentors who work remotely to meet the literacy needs of 300 adults across Ontario. For the last 3 years, various cloud services have been used to facilitate program delivery and administrative

activities, such as Google Apps, Gmail (organizational), Google Docs, and Google Drive. Instructors collaborate on learner plans from a distance, which are shared with the mentors and learners to work on goal achievement and career selection. A wiki is used to store PowerPoint slides used for courses delivered in a live online classroom through Saba Centra, which is provided free adult literacy programs in the province. The wiki is also used to house internal working documents such as expense reports and client registrations and assessments, and records of attendance and goal completion. Staff training is provided online and tech support is provided using online tutorials. Last but not least, an online chat client provides on-demand support directly from the program's Web site. One of the program managers reports that it took a year for the staff to get comfortable with the technology and that there is a varying level of comfort with them as well as some frustration with the constant change of technology applications. Overall, however, providing their services online has enabled the agency to grow and provide literacy training to their clients more effectively.

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Across the country, there have also been some well-documented uses of technologies in class-based programs. At the Saskatchewan Institute for Applied Science and Technology (SIAST) in Saskatoon, a range of trades, technology, and educational upgrading programs are offered. The Basic Education Program uses SMART Boards or BrightLink with a digital projector as well as adaptive technologies to read text aloud. At the Antigonish County Adult Learning Association (ACALA) and People's Place Library in Antigonish, Nova Scotia, USTREAM is used to stream documentaries created by program participants, who also work on developing and maintaining the television channel. At the Northwest Territories Literacy Council, a project was launched which offered adult basic educators workshops in Inuvik about how to incorporate blogging and digital storytelling into their practice [28]. In Winsor and Oshawa, adult literacy learners worked with Glogster to create an interactive poster and PhotoStory to make a "How to" video at the Adult Literacy Program of the John Howard Society of Durham Region and the Adult Literacy Program at the Windsor Public Library [29].

AQ 10

In 2011–2012, AlphaPlus, an adult literacy support organization specializing in the use of technologies, used a case study approach to "generate a better sense of how staff, volunteers and students in literacy agencies are working with digital technologies, and to better understand the opportunities and challenges presented by digital technologies in adult literacy

teaching and learning." Among the key points of the short-term study [30] were as follows:

- There is no one-size-fits-all model of digital technology integration.
- Maintenance of technology infrastructure is an issue.
- Sufficient financial resources to cover basic costs of developing and maintaining a robust technology infrastructure is crucial to success.
- Sufficient financial resources to enable programs to provide practitioners with time to explore and develop their own digital technology skills, and to incorporate and integrate digital technologies in instruction are crucial to overall success. Release time for professional development and the resources to cover release time to learn are critical issues.
- Organizational culture is important—a culture that fosters and enables professional learning and that values and promotes the use of digital technologies for teaching and learning is key to effectively integrating digital technology with adult literacy practice.
- Strategic planning and prioritization are key drivers for successful use and integration of digital technologies.
- Even students at the most basic levels of literacy can learn using digital technologies.

In these and other programs working on integrating technology-based resources, challenges are many and varied. Raising issues about their use and a critical analysis of their appropriateness for adult literacy learners is also important. Chovanec and Meckelborg [31] argue, based on research with adult literacy learners and practitioners in Edmonton, that using social media, a cloud-based service, does not necessarily bring about text-based literacy development and that ways to bridge the rich informal learning at social networking sites with nonformal and formal adult education settings need to be found. A greater use of technology-based resources is the benefit of adult literacy programs and their clients if issues that hinder their integration are addressed. Even more benefit of instructional technology can be achieved if technology-enhanced learning is made accessible in a cloud computing environment that encourages localization and sharing across the wider community.

15.5 QUESTION 4: WHAT MIGHT A CLOUD COMPUTING STRATEGY FOR ADULT LITERACY LOOK LIKE AND WHAT ARE THE CHALLENGES TO REALIZE SUCH A VISION?

Whenever a new technology is implemented, there is a tendency to first think of it and use it in terms of whatever it replaced, similar to the way automobiles were first thought of as horseless carriages. Gradually, as technology improves, it finds acceptance and stimulates new ideas and new ways of using it—much the way mobile phones merged with personal digital assistants (PDAs) to become smartphones that can access the Internet. Cloud computing is not simply an extension of the Internet; it represents a convergence of Web service provision with high-performance computing, delivered on demand over broadband networks.

Although the initial entry point of cloud computing into the education sector is the outsourcing of e-mail and collaboration software, we are beginning to see ubiquitous access to an unprecedented variety of on-demand computing services—services that require tremendous processing power for short instances—enough power to instantly convert a tourist's digital snapshot of a street sign into text, to translate the text to the target language, and to return an audio message to the user, perhaps with an accompanying map and directions back to the hotel. Such appliances are already being used and can be adapted for a wide variety of literacy applications.

However, augmenting knowledge is not the same as amplifying human learning—while we still do not fully understand how people learn best, we do know many useful ways in which technology can support learning and support the performance of daily tasks. Unfortunately, such promising practices are currently scattered and not collected together into a cohesive framework. For this, we need community building and agreements to make it possible to cut and paste instructional ideas and resources from one computing environment into another. Cloud computing can serve to provide a ubiquitous platform to make such techniques coalesce into a common infrastructure for adult literacy.

The following sections imagine a progression of cloud computing applications from simple (what we are doing now) to complex (what we might do in the future). We pass through our current state of online applications or "Apps" that provide personal computing support and community collaborations to the power that comes from being able to track language acquisition and analyze one's performance in order to prescribe

appropriate learning methods and appropriate instructional resources for literacy training. As we may also see the rise of contextualized reading devices that will help everyone decipher the text back into the spoken words it represents, the latest level are applications that make illiteracy no more an impairment than an astigmatism is for those wearing corrective eyeglasses. There are two paths to end illiteracy, and while educators might persevere in efforts to train low-literacy adults, perhaps the real power of cloud computing will be in developing methods and devices that make the stigma irrelevant.

15.5.1 Provision of Personal Computing

No fee provision of application services means anyone who can get on the Internet can have basic word processing, spreadsheets, and e-mail. Gmail, for example, also provides personal file storage and some collaboration tools. No fee cloud access is important for literacy learners as it provides an easier computing environment to learn in, and low-literacy rates go hand in hand with low computer literacy. No fee access provides an Internet identity and a continuing address for the homeless and low-income earners forced to move on a frequent basis.

Moreover, with the appearance of more inexpensive notebook computers, tablets, and smartphones, the cost of each access point is lowered, and thus, the cost of setting up public service and education Internet access facilities is decreasing rapidly. Everyone can afford these cheap devices, and with an expansion of no charge public WiFi, they will have continuing access to the Internet and the cloud.

The mobile phone market has grown to the point where there are now more mobile phones than any other computing device. Each year, more of these are smartphones capable of higher order computing tasks, displaying text, images, and video, and accessing the Internet. These devices are capable of connecting to and through the cloud computing systems. With widespread coverage and a growing installed base of users, wireless networks have the potential for supporting a variety of new on-demand data processing services. Mobile technology providers are quick to encourage growth in the number of applications (apps) by providing efficient online marketplaces such as the Apple Store or Android Market for developers to sell their products or provide them free of charge. Unfortunately, Canada still has one of the most expensive bandwidth costs for wireless access over the cellular telephone networks, so market growth of smart phones will likely be slower for lower income individuals and for those in rural

areas where many low-literacy adults reside and where free WiFi service is uncommon [32].

The hardware/software paradigm suggests that anything that could be done in hardware should be replicable by software. This is becoming true for low-cost assistive technologies such as screen readers and talking typewriters that can now be configured on the small touch screen of the smartphone. Wearable and implantable technologies are also emerging, with the potential of being connected to an omnipresent cloud that monitors one's personal health and safety. The matrix of possibilities is so vast that it might be harder to guess when these trends will appear than what will appear. Cloud computing makes it possible to augment the processing power of personal technologies in unprecedented ways.

The world of adult literacy education still awaits a substantial adoption AQ 11
of these emerging technologies, for example, a recent compilation of prom-
ising practices for online literacy training. Best et al., [33] paint a world AQ 12
heavy in text interactions and professorial facilitation. While literacy is important for scholarly activity, smart devices may soon help discretely accommodate limited language users by reading aloud or prompting contextually appropriate actions.

15.5.2 Shared Community Resources

Google Docs was originally conceived as a shared space for collaboration in creating and revising documents. This application has potential for supporting shared professional development and educational resources (computer teaching, coaching). Miller [34] suggests that the shared cloud platform also offers greater opportunities for community and work collaborations. An advantage of cloud computing in education noted by the Seattle Project [35] is that students learning programming were no longer disadvantaged by differences in their workstations (although they might be affected by differences in bandwidth). Each student was provided a virtual computer to configure and program, and shared resources were available to all the educators involved.

Since clouds have a potentially unbounded elasticity, it is possible that millions of users can be interacting at once, giving rise to spontaneous communities and interactions. In a social networking environment, there is potential for communities of literacy learners to grow and for literacy providers to develop and test shared resources and enable volunteers working from home. The resulting analytics can also greatly facilitate the ability to evaluate the usage and effectiveness of any materials provided. This is

possible now under Web services models, but with a cloud there is potential for having more interchanges of experiences, techniques, content, and learning applications. This amplifies the need for policy directions supporting openness in terms of intellectual exchanges among professionals, release of information using open licenses as open educational resources (OERs), or learning application development as open source. If millions of computer users are connected to the same cloud, essentially they could all access services using the shared network. (Facebook.com already operates a large monolithic cloud that has millions of concurrent users.) This common platform increases the potential for new types of resources that might be cooperatively developed and shared including localized lexicons, information overlays to provide directions or assist adult learning, and employer-specific job training materials.

Programmers in a cloud's user population could contribute in developing or customizing the software and services, much as they do in creating open-source software. Sharing of applications will accelerate the development and spread of new functions the way creative common licensing has accelerated the spread of content and lessons as OERs.

Another possibility is the "crowdsourcing" of volunteer literacy coaches and translators. In the "real world," Englishtown (www.diverbo.com) is a Spanish training organization that offers free room and board to hundreds of anglophones each summer who are willing to spend a week or more tutoring Spaniards in the English language. Lucifer Chu has also demonstrated crowd-sourcing of 20,000 volunteers for the translation of MIT Open CourseWare into Chinese [36]. Using the cloud to build a social network for the adult literacy community, providers can similarly harness the power of volunteers across Canada to support learners and build a useful collection of artifacts and exercises. The United Nations has created an international network of online volunteers who aid in course development, translation, programming, advice, and support (http://www.onlinevolunteering.org/). This type of service for developing countries can be duplicated in Canada to take advantage of the growing number of educated retirees who wish to volunteer their time to support adult literacy initiatives.

A pan-Canadian literacy cloud, combined with accessible and inclusive repositories of OERs that can be used, reused, mixed and mashed, and localized for specific populations would also be of immense help in augmenting the capacity of the diverse adult literacy organizations across the country. The beginnings of such a community of practice can be

seen in Tutela.ca, a repository of learning resources for teachers serving newcomers to Canada.

15.5.3 Persistent Personal Storage—Augmenting Cognition

In addition to massive computing power, cloud computer farms also offer rapidly accessible and massive file storage. Cloud-based personal portfolios could readily be used to track the acquisition and use of learning content by learners, and allow the storage of learning artifacts captured on pocket cameras or mobile phones. These ideas exist in some custom server applications, but the reality is that the cloud will make them faster, with more memory, and more accessible from almost anywhere that bandwidth is sufficient and affordable. Local organization or employers could create verbal lexicons. Today, GPS-equipped smartphones can serve as just-in-time training aids—for example, Øhrstrøm [37] has demonstrated the use of smartphones in Norway as procedural aids for autistic teenagers. Routine tasks such as taking a bus are presented as a series of location-triggered action prompts that the child can refer to as required. This allows the autistic child freedom to travel in a relatively large geographic area while having the security of a smartphone equipped with a repertoire of situational procedures. A personalized "my guide to my community" could help newcomers understand and access services available in their Canadian location.

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15.5.4 Analytics and Personalization

Analytics refers to a wide range of data processing methods that use data from a wide range of sources to make inferential decisions about a situation and recommend a path of action. At the low end are a wide variety of computer-based learning tutorials, some of which have been linked to course management systems to keep track of student progress. Performance tracking involves the collection of data about an individual's progress through a set of online learning activities. By tracking the speed and outcomes of learning activities, an individual's performance can be compared to aggregate histories of a large numbers of learners moving through the same courses. The resulting analysis can lead to pattern matching and identification of persistent learner errors and personal characteristics (such as speed of cognitive processing) that could forecast learner outcomes or be used to prescribe remedial exercises.

These computational methods are used to track credit card purchases and identify activities that are uncharacteristic of the cardholder's

previous purchasing patterns, potentially indicating inappropriate use. The emerging research in this area involves tracking data and providing analytics to suggest optimal learning paths based on learners' preferences and observed performance.

The elasticity of cloud computing is ideal for this kind of large-scale instantaneous analysis. Not all the data need to be gathered automatically—teachers at the Open High School of Utah track student progress by making notes in a constituent relationship management (CRM) system. As teachers interact with students, they make notes of progress and problems, and the system prompts the teacher whenever a student falls behind or fails to keep in touch [38]. If installed in a cloud computer, such a tracking system could help teachers everywhere monitor the progress of learners and provide the social contact and personalization that is so important for learner engagement and retention.

Cloud computing already supports a wide range of virtual worlds and online multiplayer games; teenagers spend innumerable hours on their X-BOXes, Playstations, and other gaming systems, using avatars to form teams for virtual assaults on military targets in cyberspace. Today's games are highly collaborative and interactive. Players can communicate with each other using headsets or text and they learn how to form groups to cooperatively develop strategies and solutions in team-based game environments. While much learning takes place with these games, it has little intentional learning related to the skills of reading, writing, and arithmetic. Educational games come across as being rather dull in comparison—imagine the gains that could be made if content and applications enabling literacy learning were embedded in such massively subscribed cloud-based edutainment systems.

15.5.5 Policy Issues

Policy and control issues are crucial. The provincial/federal disputes are a major cause of fragmentation across the country. This and other issues such as regulatory compliance to ensure security, enable audits, and preserve privacy represent significant barriers to the adoption of cloud computing in adult literacy circles. Although a common platform affords easier collaboration, it also increases security risks. In particular, the areas of identification and authentication require will require new schemes to preserve privacy and gain the trust of the users, while developing measures to boost the security of publicly accessible systems that may come under attack. Much work has been done in these areas with the creation of

federations that act as local authentication agents for individuals to access broader cloud assets. However, the continuous parade of lost identity cases serves to both remind and undermine the degree of confidence that should be afforded service providers.

15.5.6 Beyond Text—Is Literacy Obsolete?

Early digital computers had to be programmed using binary code, and only in the 1970s, did we see higher level computer languages that allowed programmers to specify directions in English-like text commands. Today many computers (like those used in a car's navigation system) can be directly interfaced by voice commands. Indeed, smartphones equipped with cameras can easily read QR codes and retrieve related messages from AQ 14
the Internet—including short video clips or other situation-relevant material. With enhanced processing, text analysis can be made available to scan and interpret text—not just into English, but through other Web services such as Google Translate, into the target language of choice. For the large number of new Canadians who struggle in adult basic education classes, this form of literacy appliance can be an excellent assistive technology. Voice to text, text to voice, French to English, or Chinese or any other lan- AQ 15
guage, we are approaching the era where the universal translator once the stuff of science fiction (like the Babel Fish translator in the Hitchhiker's Guide to the Galaxy) is becoming a reality.

Universal literacy is a fairly modern concept that came along with the industrial revolution and the need to have a literate population to work and communicate in the era of the post office. Before literacy, specialists called "scribes" were called upon to write and read letters dictated by the illiterate members of their community. Perhaps, voice and video over Internet and mobile phones have flattened the need for this type of training, and with electronic book readers, the illiterate have gained access to copious amounts of text information. In parts of Africa, the tribal drums have given way to solar-powered FM radio transmitters and mobile phones—neither of which rely on the heavy burden of text that extracts so many years of anguish on the dyslexic population and others that have the misfortune of reading difficulties. In the near future, speech-to-text and text-to-speech applications will help to level the playing field for those with learning difficulties or who have not had the advantage of a good school in early life. While text literacy might not become obsolete, it may, like Latin, become less significant as an element to a person's immediate and direct participation in society. Nonetheless, computer literacy and access

to computing resources will continue to increase in importance and will grow as a critical component in the curriculum of adult education.

15.5.7 Conclusion—The Impact of Cloud Computing on Adult Education and Literacy

This chapter provides a glance at rapidly emerging technology and attempts to grasp its potential impact for the world of adult learning and literacy. Let us recap some basic notions.

First of all, "cloud computing" is a movement toward utility computing where large "server farms" located next to "green energy" sources and connected by low-power high-bandwidth fiber optics will provide the computing infrastructure for many small, medium, and large organizations that can no longer cost-effectively provision their own in-house IT systems. The first of these commercial systems have already been launched by companies such as Amazon, Google, and Microsoft, and many more are being planned. Cloud computing facilities are also being used for research and for government services. Some clouds are public and can be used by anyone; others are private and tightly secured to protect the privacy of the information contained. Both Microsoft and Google are giving away cloud computing capacity to educational organizations to run custom e-mail and other documentation sharing services. This appeals to universities because student e-mail alone is costing them hundreds of thousands of dollars each year.

Thus, a *first step* toward the use of cloud computing by an adult literacy community could be to recommend to learners the *use of the free services* available or make a special e-mail arrangement with one of these providers if a branded e-mail address is preferred. It would be ideal if a significant number of adult literacy providers in Canada could collaborate on this approach, because then the same cloud provider could host a portfolio of specialized services of benefit to learners with literacy difficulties. It would also make it easier to codevelop and share other services in the future. Every adult literacy learner would benefit by having free e-mail and free access to these services, and the adult literacy community could benefit by using the data collected to refine software and determine new services that might be useful. This could all be achieved without losing traditional organizational or institutional e-mail identities or "logo brands." Probably, it would take more time to negotiate the collaboration agreement among the literacy providers than to implement the technical service, so this would require vision and leadership to pave the way.

The emergence of a consolidated collaborative cyber community for adult literacy would show the way to future collaborations in literacy training software, literacy appliance software, instructor professional development, and research. It would also be possible for an adult literacy learner to have continuity of e-mail and literacy support if they moved from one community to another.

The *second* important notion is that cloud computing is "elastic" and provides computing power on demand. Just as cyber security codes can be quickly hacked by tasking a thousand virtual machines to work for 2 minutes, powerful analysis routines could help track and coach literacy learners in a just-in-time analysis of their needs. This is not "ready to go," but it is within the realm of current knowledge and systems; however, the knowledge and routines are scattered in pockets. Identifying requirements and unifying the system to do, this should be the *second step*. This can only be done effectively by organizing the community of practice to become involved.

Assuming that a community can be coordinated, once the basic parameters are known, many of the lessons can be assembled from OER repositories and documented; others might be created or mixed through the "wisdom of crowds" wherein tasks are distributed among the many community literacy volunteers and researchers. Collaborative research projects could be sought after creating the analytic software to track and coach individuals as individuals who are working toward common goals. (Richards proposed this concept in 2009 as the Community Open Literacy Toolkit.)

Third, in order to take full advantage of the affordances enabled by cloud computing, the adult learning community needs to support the development, adaptation, assembly, and dissemination of OER. With proprietary content and applications, the burden of requesting permission and/or having to pay again and again as the materials are used and reused in different formats significantly negates the advantages of the cloud. Users need to have free reign to mix and remix the content and adapt it for voice and video as appropriate for their learners. The cloud can provide learners and their organizations with access to the growing number of free open education resources as well as open-source applications supporting social interaction, publishing, collaborating, editing, content creation, computing, and so on [39].

The *fourth* notion is that literacy training can be augmented with literacy appliance software that provides just-in-time assistance to

low-literacy adults. The range of software could include text-to-voice, voice-to-text, bar code and QR code reading, and language translation. Much of these services exist as *Web services*, but they need to be harnessed and brought together in a suite of applications accessible and usable by the low-literacy population. Cloud computing can both provide a collaborative portal for these services as well as the high-power computing necessary to extract the text or shapes from pictures and generate the appropriate response including related information that might be available. While literacy would be ideal, such applications may make it possible for low-literacy adults to participate more inclusively in everyday life. The benefits of such adaptations can be expected to benefit other populations such as seniors or tourists.

Fifth, cloud computing and the Internet are available through an increasing number of mobile devices—in fact, more adult literacy learners have mobile phones rather than personal computers and mobile tablets are becoming increasingly more popular and are beginning to augment and even replace laptops and netbooks. Thus, mobile devices as a delivery platform should be given priority for research and technical development—over printed texts and personal computers. These mobile devices represent the state of the art, and they go where the adult learners go, and are becoming the platform of choice for accessing a wide range of services including training through *mobile learning*.

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Sixth, finally and most significantly, is the reality that it is becoming impossible to conceive a modern definition of literacy that excludes ICT literacy. The growing importance of the Internet and networking skills for adults must be recognized. A 21st century literacy is not possible without the skills for accessing and using the Internet. The cloud can be the doorway to these skills.

Cloud computing is at the adult literacy doorstep, but it will take time to implement the above ideas. Some of these ideas face technical barriers, others face cultural and political barriers, and some have distant ideas in need of more research. However, they do provide a unified vision of what is possible, if the adult literacy community can collaborate together for mutual benefit. Then all literacy providers and the adult literacy learners will surely benefit from the synergies that emerge. Canada is large and vast—the literacy movement needs to coordinate its efforts in a way that retains and reinforces the local roots and human face. Cloud computing provides an affordable opportunity to plan a new future together.

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Author Query Sheet

Chapter No: 15

Query No	Queries	Response
AQ 1	Please provide the significance of the bolded text.	
AQ 2	Please check the text 'so what is a few thousands more' for clarity.	
AQ 3	Please check the text 'recover the costs or for profit' for clarity.	
AQ 4	Please provide the significance of the symbol '?' in Figure 15.1.	
AQ 5	Please confirm if the Latin term 'ad hoc' can be italicized.	
AQ 6	Please confirm if 'five-9s' can be changed to 'five nines'.	
AQ 7	Please provide the full form of 'BC'.	
AQ 8	Please check the text 'a strong following among literacy providers' for clarity.	
AQ 9	Please confirm if 'tech support' can be changed to 'technical support'.	
AQ 10	Please confirm if 'USTREAM' can be changed to 'Ustream'.	
AQ 11	Please confirm if the edits made to the sentence 'The world of adult …' are OK.	
AQ 12	Please check the text 'paint a world heavy in text interactions' for clarity.	
AQ 13	Please provide the full form of 'GPS'.	
AQ 14	Please provide the full form of 'QR'.	
AQ 15	Please confirm if the edits made to the sentence 'Voice to text,…' are OK.	
AQ 16	Please check the text 'they go where the adult learners go' for clarity.	
AQ 17	The provided URL is not valid in reference 'Contact North 2010'. Please check.	

AQ 18	The provided URL is not valid in reference 'Mell and Grance 2009'. Please check.	
AQ 19	The provided URL is not valid in reference 'Roth 2010'. Please check.	
AQ 20	The provided URL is not valid in reference 'Fleer and Raban 2005.' Please check.	
AQ 21	The provided URL is not valid in reference 'Horsman and Woodrow 2006.' Please check.	
AQ 22	The provided URL is not valid in reference 'Movement for Canadian Literacy 2007.' Please check.	
AQ 23	The provided URL is not valid in reference 'Kurzweil Educational Systems 2005.' Please check.	